DOCUMENT RESUME

ED 307 289 TM 013 278

AUTHOR Olson, George H.
TITLE Date of Birth and Its Effect upon Performance in School over Subsequent Years.
PUB DATE Apr 89
NOTE 20p.; Paper presented at the Annual Meeting of the American Educational Research Association (San Francisco, March 27-31, 1989).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Academic Achievement; *Age Differences; Age Grade Placement; Elementary Education; *Grade 1; Individual Development; Individual Differences; Longitudinal Studies; *Predictor Variables; Primary Education; *School Entrance Age; School Readiness; *Young Children

ABSTRACT

The effects of age at entrance into school on subsequent elementary school performance were studied in a cohort of children who started grade 1 in the Dallas school system (Texas) in fall 1981. Most of the subjects were born on or after September 1, 1974 and before September 1, 1975; the spread of ages was 1 year. A total of 3,028 male and 3,019 female students was grouped into four seasonal categories based on time of birth. The subjects were between 6 and 7 years old when they entered grade 1. The Iowa Tests of Basic Skills were administered routinely to all of the students in all grade levels over the 6 years studied (1982 through 1987). In both mathematics and reading, older children began with an advantage over younger children and maintained this advantage through the 6 years studied. The advantage did not appear to be that of an accelerated learning rate, but rather that of a constant difference through elementary school. The performances of the oldest boys were comparable with those of the youngest girls, suggesting that maturation and development played a major role in the differential effects due to age. However, when the seasonal groups were compared, children entering grade 1 between the ages of 6 years 6 months and 6 years 9 months out performed those entering grade 1 between the ages of 6 years and 6 years 3 months; this difference remained constant and cannot be explained on the basis of maturation. Five tables and 10 graphs present study data. (SLD)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED307289

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☑ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
GEORGE H. OLSON
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Date of Birth and Its Effect Upon Performance in School Over Subsequent Years

George H. Olson
Dallas Independent School District

Parents, as well as many educators, are confused with respect to the effects of early entry into first grade. On the one hand, parent advocates, with the approval of many educators, are pushing their young children into school as early as possible; on the other hand, other parents, again with the support of educators, are in effect "redshirting" their children in order to gain them an additional year's maturation. At issue is the relatively large differences in social, emotional, and cognitive development among children up to a year or more apart in chronological age at the time they enter the formal educational system.

The research on this issue has been no less confusing. Uphoff and Gilmore (1985) revieved several studies that compared children meeting entrance age requirements by less than three months (so called "summer children") with those meeting the requirements by more than three months. They concluded that the younger children suffered many disadvantages including lover average grades, lover standardized test scores, higher rates of retention, and a greater number of academic difficulties. In contrast, Kinard and Reinherz (1986) concluded from the results of their longitudinal study that while birthdate effects with respect to measures of performance and adjustment existed upon first entering school these differences all but disappeared in subsequent years of elementary school. Furthermore, Proctor, Black, and Feldhauser (1986), from another review of research studies, concluded that younger children who had been selected as being ready for school fared as well as or better than older children in later years.

The study reported here is a longitudinal investigation of one cohort of children who started first grade in the Dallas school system in fall 1981. All the students included in the study were of typical age (born on or after September 1, 1974 and before September 1, 1975) at the time they first entered first grade. Thus, the spread of ages was merely one year, not as great, perhaps, as might be desired for a more thorough investigation of age effects. However, for first graders, one year can represent as much as a 20 percent difference in age between the youngest and oldest children.

Paper presented at Session 10.34 of the April 1989 Annual Meeting of the American Educational Association in San Francisco.

TM013278

BEST COPY AVAILABLE

Procedures

Selection of Cohort. To study the effects of age at entry into first grade, a cohort of pupils entering Grade One in fall 1981 was identified as follows. The district's historical student database was searched for youngsters meeting the following criteria:

1. Present in Grade One at the end of the first six weeks of the first semester of the 1981-82 school year.

2. Either not enrolled or enrolled in kindergarten the previous year (1980-81).

3. Present at the end of the 1986-87 school year.

4. Had norm-referenced achievement data (reading and/or mathematics) available for each year over the six years studied.

The search netted 6,246 cases.

Next, each pupil was assigned to one of six groups based upon date of birth (or age at time of entry into first grade). Thus, the following six groups were identified:

Over Age: Born before September 1, 1974; over seven years old when entering first grade; 153 cases identified.

Fall: Born between September 1 and November 30, 1974; six years nine months to seven years old at time of entry into first grade; 1,497 cases identified.

Winter: Born between December 1, 1974 and February 29, 1975; six years and six months to six years and nine months old when entering first grade; 1,467 cases.

Spring: Born between March 1 and May 31, 1975; six, three months to six years and six months old at time of first entry into first grade; 1,499 cases.

Summer: Born between June 1 and August 31, 1975; six years to six years and three months old at time of entry into first grade; 1,584 cases identified.

Under Age: Born after August 31, 1975; under six years old when first entering first grade; 46 cases were identified.

For a variety of reasons (e.g., too few Under Age cases, obvious coding errors for birthdates among Over Age cases) only the four "seasonal" groups were studied.

Measures of Achievement. The measures of achievement used in this study were the composite reading and mathematics subtests of the Iova Tests of Basic Skills (ITBS). These tests were administered routinely at

all grade levels near the end of each school year. Grade equivalent scores were used.

Data Analyses and Results

Prior to performing more detailed analyses, the possibility of differential sex and race/ethnic effects among seasonal groups was examined. Groups counts and frequencies by sex and race/ethnicity are given in Table 1.

Table 1

Numbers of Cases by Gender and Race/Ethnicity

	GENDER				RACE/ETHNICITY							
	MALE		FEMALE		WHITE		BLACK		HISPANIC		OTHER	
Group	N	%	N	%	N	%	N	%	N	%	N	%
Summer	755	25.0	829	27.5	236	25.0	868	26.9	456	25.3	24	32.0
Spring	787	25.9	712	23.6	235	24.9	778	24.1	462	25.7	24	32.0
Winter	744	25.6	723	23.9	226	24.0	799	24.8	425	23.6	17	22.7
Fall	742	24.5	755	25.0	246	26.1	783	24.3	458	25.4	10	13.3
Total	3028		3019		943		3228		1801		75	

Note: Percentages are of column totals.

Chi square tests did not reject the hypotheses of independence of season and gender ($\chi^2 = 7.46$; df = 3; $p = .06$) or season and race/ethnicity ($\chi^2 = 11.12$; df = 9; $p = .27$). Thus there was no reason to suspect bias in the results due to differential selection of sex or race.

Seasonal Group Achievement Over Six Years. The group grade equivalent score means, in reading and mathematics, over the six years studied are given in Table 2 and shown graphically in Figures 1 and 2. A multivariate analysis of variance (Olson, 1975, Note 1) of the among-group vectors over years was significant for both reading ($F_{18,14349} = 6.73$; $p < .01$) and mathematics ($F_{18,13699} = 9.80$; $p < .01$). In both areas of achievement it appears that older youth begin with an advantage over younger youth and maintain this advantage over the duration of their elementary school education.

Furthermore, an analysis of the differences in group profiles found no evidence of differential rates of achievement growth among groups either in reading ($F_{15,14007} = .91$; $p > .1$) or mathematics ($F_{15,12819} = 1.17$; $p > .1$); i.e. the interaction of profile by season was nonsignificant.

Thus the advantage enjoyed by older kids does not seem to be that of an accelerated learning rate but rather a constant difference over the six years studied.

Table 2

Mean Grade Equivalent Scores
in Reading and Mathematics for Seasonal Groups
Over Six Academic Years

Group	Year of Fall Semester 1982	1983	1984	1985	1986	1987
			READING			
Summer	1.77	2.81	3.46	4.26	4.95	5.88
Spring	1.85	2.91	3.52	4.33	5.01	5.96
Winter	1.96	3.05	3.68	4.51	4.15	6.10
Fall	2.07	3.16	3.81	4.65	5.36	6.31
			MATHEMATICS			
Summer	1.81	2.90	3.83	4.70	5.29	6.48
Spring	1.90	3.03	3.94	4.78	5.35	6.60
Winter	2.00	3.14	4.07	4.95	5.56	6.75
Fall	2.08	3.24	4.16	5.06	5.69	6.86

Males vs. Females. Gender has often been found to play a role in early school achievement and adjustment (Anastas & Reinherz, 1984, Eme, 1979). Girls have been found to mature earlier than boys in both cognitive and emotional development. Therefore, it is of some interest to compare the achievement performances of boys and girls. We might expect, for instance, that if maturation is an important factor, the achievement of older boys would more closely resemble the achievement of younger girls.

In fact, this is exactly what was found. The mean grade equivalent scores, in reading and mathematics, are displayed in Table 3 for male and female pupils. Graphs of these data, showing all groups, are given in Figures 3 and 4, for reading and mathematics, respectively. Clearer graphs, in which the performances of younger (Summer) and older (Fall) boys and girls has been isolated, are given in Figures 5 and 6. As can be seen, even though the Fall children of either sex continue to perform better than Summer children, the achievement curves of the Fall males and Summer females nearly coincide.

Table 3

Mean Grade Equivalent Scores in Reading and Mathematics for Male and Female Children by Seasonal Grouping

	Males						Females					
Group	'82	'83	'84	'85	'86	'87	'82	'83	'84	'85	'86	'87
					READING							
Summer	1.66	2.60	3.22	4.05	4.59	5.42	1.79	2.83	3.52	4.28	4.93	5.89
Spring	1.72	2.69	3.34	4.12	4.74	5.62	1.92	2.99	3.61	4.41	5.09	6.05
Winter	1.84	2.85	3.47	4.33	4.88	5.80	2.01	3.10	3.76	4.66	5.17	6.15
Fall	1.96	3.01	3.61	4.48	5.02	5.96	2.10	3.19	3.85	4.63	5.36	6.36
					MATHEMATICS							
Summer	1.77	2.80	3.64	4.49	4.93	6.08	1.78	2.84	3.80	4.73	5.29	6.47
Spring	1.84	2.92	3.81	4.60	5.08	6.34	1.91	3.03	3.94	4.83	5.42	6.67
Winter	1.94	3.04	3.92	4.81	5.29	6.46	1.97	3.09	4.03	4.93	5.54	6.71
Fall	2.06	3.16	4.04	4.89	5.37	6.54	2.06	3.20	4.15	5.08	5.69	6.88

Retention Rates. Table 4 details the promotion and retention rates for each group over the six years studied. While differences are small, the trend is clear. The likelihood of being retained, at any specific grade level, decreases with increasing age. In fall 1982, for instance, 22.6 percent of the Summer children were retained in the first grade as compared to only 12 percent of the Fall children. The next year, 7.5 percent of the Summer children failed to be promoted out of the second grade as compared to 5.4 percent of the Fall children. In fall 1986 1.3 percent of the previous year's fifth grade Summer children were not promoted to Grade Six. Among Fall children the comparable failure rate was .7 percent.

Retained vs. Not Retained Pupils. The differential retention rates shown in Table 4 suggested that the analyses distinguish between retained and not-retained pupils. One way to do this is to consider achievement growth beginning with the year students in each group (retained, not retained) were last in the first grade. This has been done in Table 5 where mean reading and mathematics grade equivalent scores are given over five years, since the kids were last in first grade, for retained and not retained youngsters. The data are shown graphically in Figures 7 and 8.

A separate multivariate analysis of variance of group differences was performed for the reading and mathematics data. The tests for main effects due to retention vs. non retention were both significant (reading: $F_{5,5203} = 108.90$; $p < .001$; mathematics: $F_{5,4982} = 262.68$; $p < .001$) as were the tests for differences between retained and not retained

Table 4

Promotion and Retention Rates

Year	Grade Level 1	2	3	4	5	6
Summer						
81-82	1584					
82-83	358	1226 (77.4%)*				
83-84	7	443	1134 (92.5%)			
84-85		30	478	1076 (94.9%)		
85-86		2	48	504	1030 (95.7%)	
86-87			2	84	481	1017 (98.7%)
Spring						
81-82	1499					
82-83	267	1232 (82.2%)				
83-84	7	342	1150 (93.3%)			
84-85		17	385	1097 (95.4%)		
85-86			31	418	1050 (95.7%)	
86-87				54	415	1030 (98.1%)
Winter						
81-82	1467					
82-83	203	1264 (86.2%)				
83-84	3	263	1210 (95.0%)			
84-85	1	13	310	1143 (95.2%)		
85-86		1	18	352	1096 (95.9%)	
86-87			1	48	332	1086 (99.1%)
Fall						
81-82	1497					
82-83	180	1317 (88.0%)				
83-84	1	242	1246 (94.6%)			
84-85		4	281	1212 (97.3%)		
85-86			12	329	1156 (95.4%)	
86-87				26	323	1148 (99.3%)

*Percentages of pupils promoted from the previous grade the previous year are given in parentheses. Thus, 77.4% of the 1584 Summer pupils in Grade 1 in 1981-82 were promoted to Grade 2 for 1982-83.

groups in rate of achievement growth over years (profile analysis) (reading: $F_{4,3204} = 133.00$; $p < .001$; mathematics: $F_{4,4983} = 328.37$; $p < .001$). Among the remaining effects tested (main effects due to seasons, interaction of seasons with retention/non retention) only the test for differences among mean vectors in mathematics was significant ($F_{4,4983} = 3.01$; $p < .05$).

Thus, the apparent differences between retained and non-retained pupils shown in Figures 7 and 8 were significant. Not only did the two groups differ in terms of overall achievement, they differed in terms of their rates of achievement -- retained children progressed at a slower pace.

While not exactly justified due to the absence of a significant interaction between seasons and retention/non retention, simple effects analyses were performed within retained and not retained groups. Among the retained students, a seasonal effect was found only in mathematics ($F_{15,13734} = 1.72$; $p < .05$). Among the not retained students, on the other hand, seasonal effects were found in both reading and mathematics (reading: $F_{15,14364} = 5.31$; $p < .001$; mathematics: $F_{15,13734} = 6.73$; $p < .001$).

The results of the simple effects analyses are shown more clearly in Figures 9 and 10, where the curves for retained and not retained, Fall and Summer children have been isolated. Among the not retained children, the curves for Fall group is clearly different from that of the younger, Spring group, in both reading and mathematics. Among the retained groups, the curves for the Fall and Summer children were different only in terms of mathematics achievement. In all cases, where significant differences existed, Fall children outperformed Summer children. In fact, significant differences aside, wherever the seasonal groups are compared, there ordering is: Fall on top, followed in turn by Winter, Spring, and Summer.

Summary and Conclusions

The results reported here suggest a very definite effect associated with children's age at the time they enter first grade. By the end of the first year of school younger children experienced a disadvantagement of three tenths of a year in reading and nearly the same amount in mathematics when compared to their oldest peers. Furthermore, this disadvantagement persisted throughout their elementary school careers.

When the oldest boys were compared to the youngest of the presumably more mature girls in terms of achievement there performances appeared nearly identical. This suggests that maturation and development plays a major role in the differential effects due to age. However, the comparisons among age groups within those who were retained in Grade One and those who were not suggests that the observed effects were not do to maturation alone.

While it is true that kids may be retained for a variety of reasons including poorer ability or a lessened capacity for learning, it is likely that, if maturation were the only important factor in the age effect, a

Table 5

Mean Grade Equivalent Scores in Reading and Mathematics for Pupils Retained and Not Retained in Grade One

Group	READING					MATHEMATICS				
	Last Five Years of Schooling					Last Five Years of Schooling				
	1	2	3	4	5	1	2	3	4	5
RETAINED IN GRADE ONE										
Summer	1.97	2.53	2.24	3.64	4.35	2.05	2.85	3.60	3.87	5.01
Spring	1.87	2.44	3.12	3.55	4.24	2.13	2.87	3.64	3.86	5.38
Winter	1.93	2.54	3.25	3.47	4.34	2.09	2.80	3.53	3.79	4.84
Fall	1.96	2.45	3.16	3.54	4.40	2.22	3.03	3.79	3.99	5.22
NOT RETAINED IN GRADE ONE										
Summer	1.90	2.98	3.66	4.47	5.21	1.91	3.07	4.03	4.92	5.57
Spring	1.96	3.07	3.70	4.53	5.25	2.00	3.18	4.12	4.98	5.60
Winter	2.05	3.17	3.80	4.65	5.34	2.07	3.25	4.20	4.98	5.60
Fall	2.15	3.28	3.94	4.79	5.53	2.14	3.33	4.27	5.17	5.85

large number of the the younger children would have been retained principally due to their immaturity (in fact a higher rate of retention among younger children was observed). If this were true then these children, who would have been among the oldest first graders their second time around, should have evidenced achievement curves similar at least to those of the youngest children among the group that was not retained. This was not observed, however; the subsequent achievement curves for age groups within the larger group of retained pupils did not even approximate the curves for the non-retained children. What was found, at least in the case of mathematics, was the nov familiar pattern that older children among those retained performed better than the youngest retained children.

Of greatest concern, perhaps, is the finding of a fairly constant performance differential among age groups over subsequent years in elementary school. In reading, Fall children remained about two and a half to three tenths of a year ahead for Summer children. In mathematics the differential was two to nearly three tenths of a year's growth. This differential cannot be explained solely on the basis of maturation. Perhaps additional research will provide an explanation.

Notes.

Olson, G. H. Applications of the Multivariate General Linear Hypothesis in Educational Research and Evaluation. Paper presented at Session 3.09 of the March 1975 annual meeting of the American Educational Research Association in Washington D.C. Available from the author on request.

References

Anastas, J.W., & Reinherz, H. Gender differences in learning and adjustment problems in school: Results of a longitudinal study. American Journal of Orthopsychiatry, 1984, 54, 110-122.

Eme, R. Sex differences in childhood psychopathology: A review. Psychological Bulletin, 1979, 86, 574-593.

Kinard, E.M. & Reinherz, H. Birthdate effects on school performance and adjustment: A longitudinal study. Journal of Educational Research, 1986, 79, 366-372.

Proctor, T., et. al. Early admission of selected children to elementary school. Journal of Educational Research, 1987, 80, 70-76.

Uphoff, J.K. & Gilmore, J. Pupil age at school entrance -- How many are ready for success? Educational Leadership, 1985, 43, 86-90.

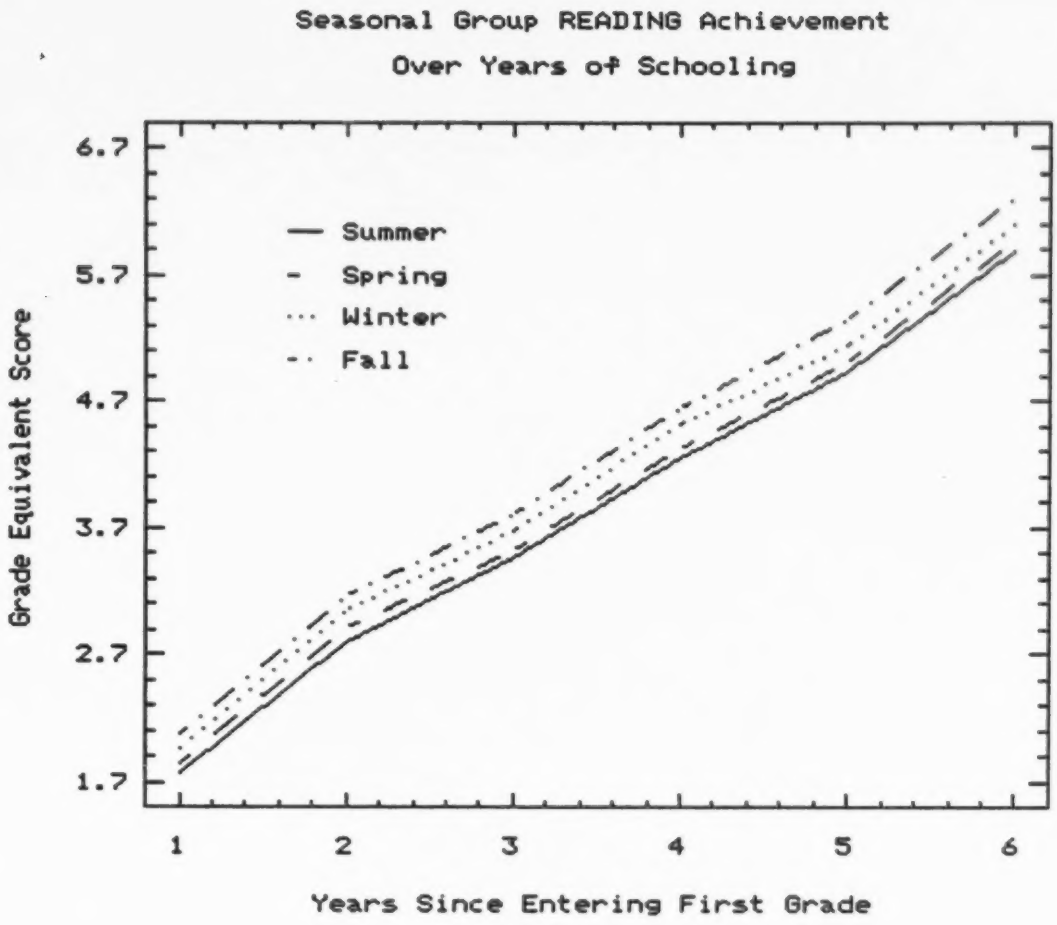
Seasonal Group READING Achievement
Over Years of Schooling
Grade Equivalent Score
6.7
5.7
4.7
3.7
2.7
1.7
Summer
Spring
Winter
Fall
1
2
3
4
5
6
Years Since Entering First Grade

Figure 1

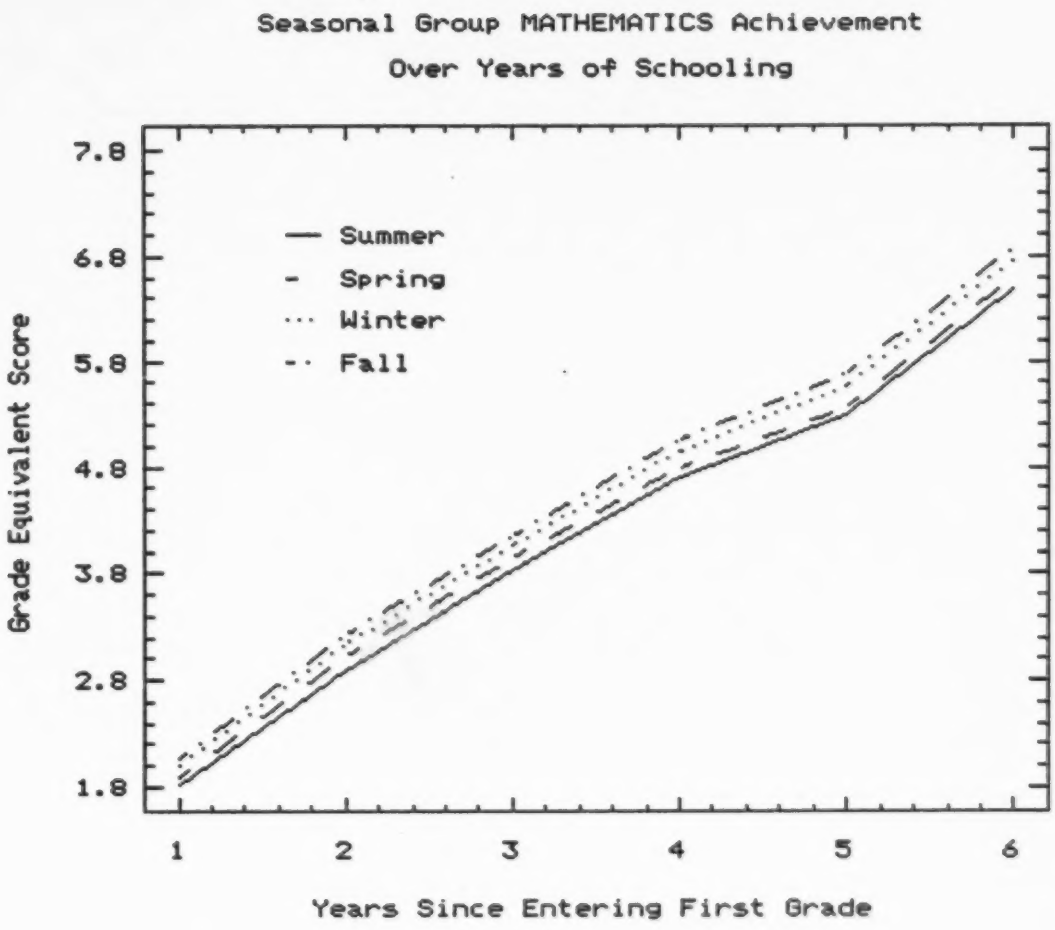
Seasonal Group MATHEMATICS Achievement
Over Years of Schooling
Grade Equivalent Score
7.8
6.8
5.8
4.8
3.8
2.8
1.8
Summer
Spring
Winter
Fall
1
2
3
4
5
6
Years Since Entering First Grade

Figure 2

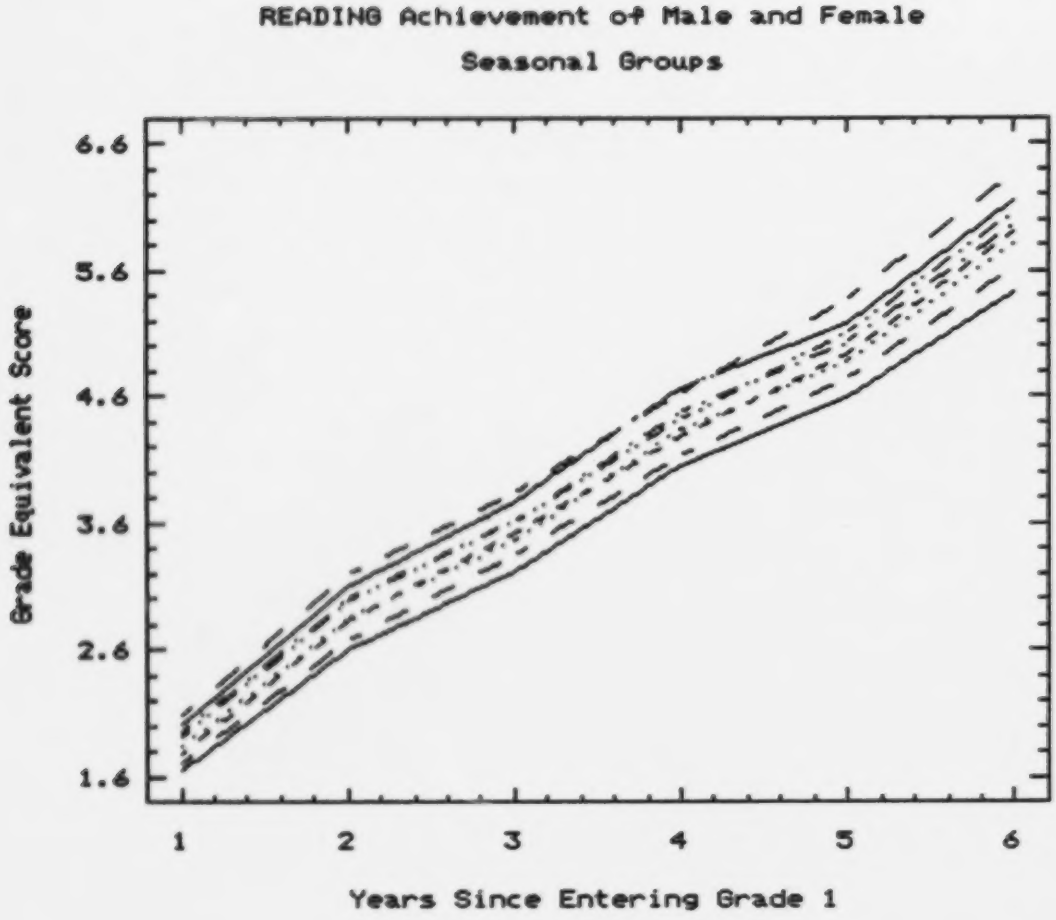
READING Achievement of Male and Female
Seasonal Groups
Grade Equivalent Score
6.6
5.6
4.6
3.6
2.6
1.6
1
2
3
4
5
6
Years Since Entering Grade 1

Figure 3

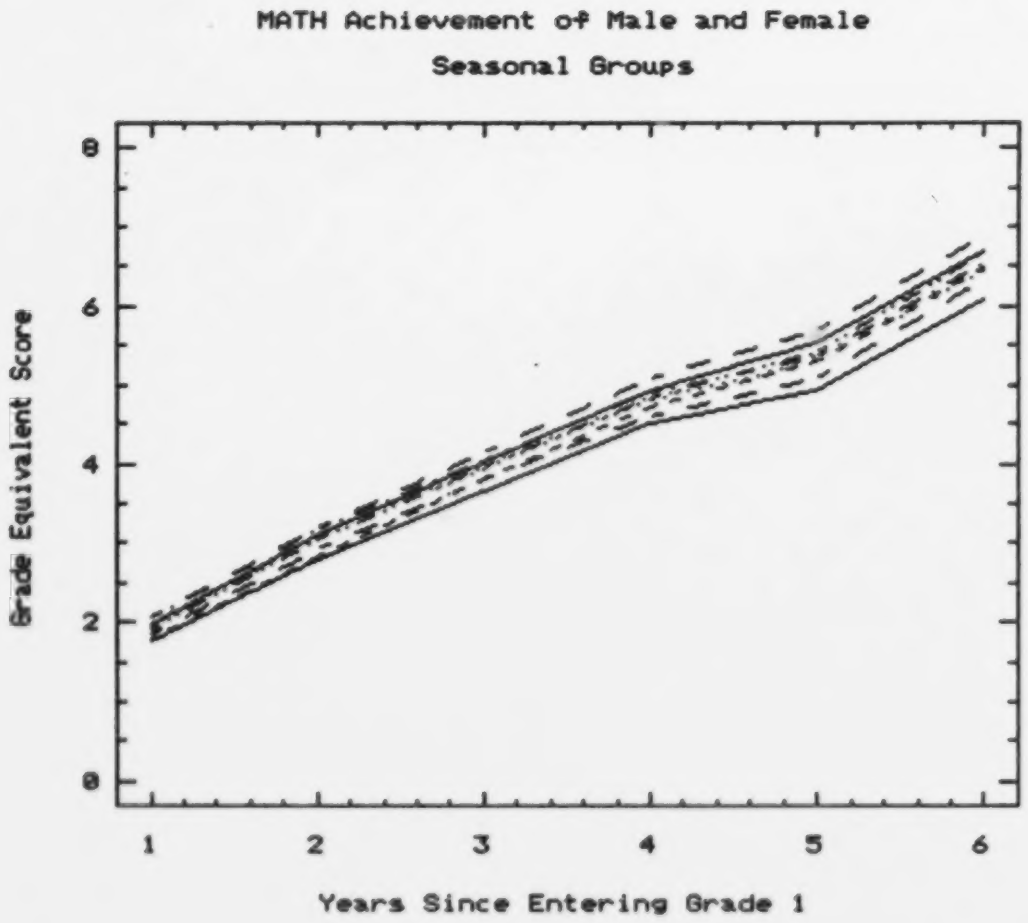
MATH Achievement of Male and Female
Seasonal Groups
Grade Equivalent Score
0
2
4
6
8
1
2
3
4
5
6
Years Since Entering Grade 1

Figure 4

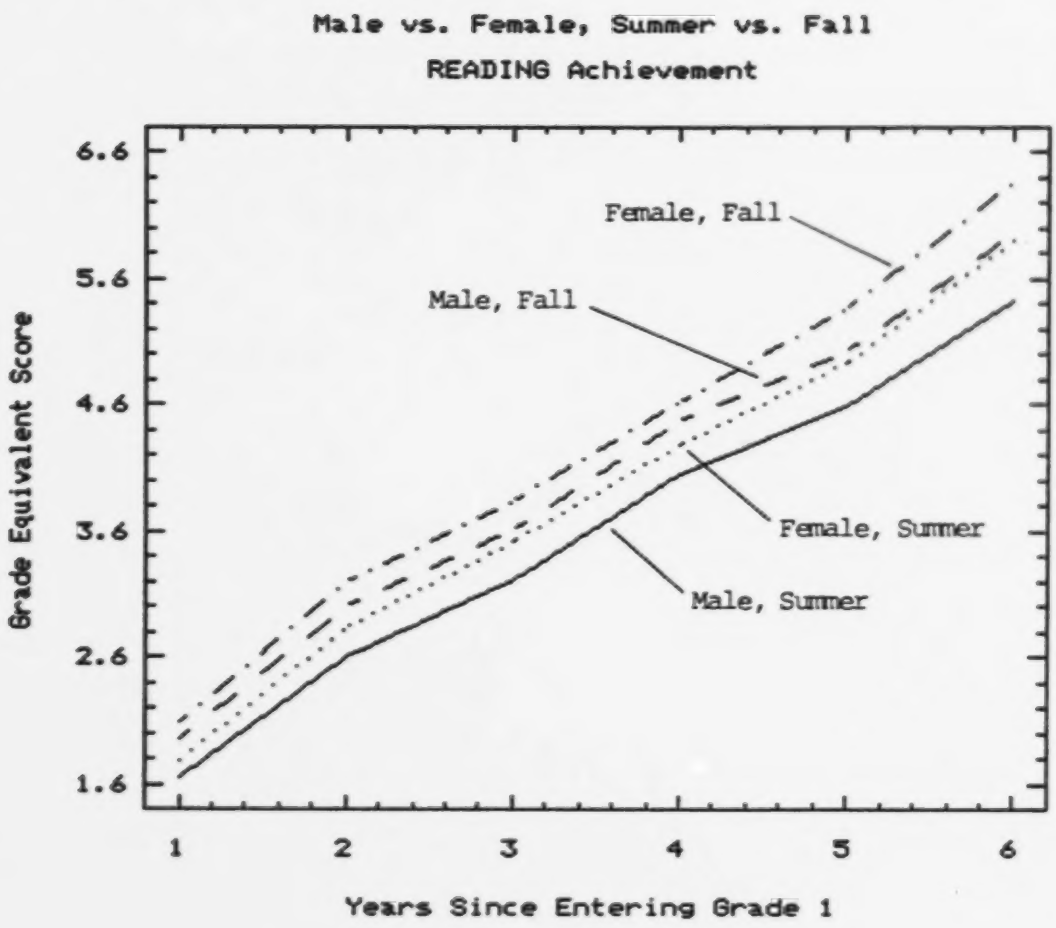
Male vs. Female, Summer vs. Fall
READING Achievement
6.6
5.6
4.6
3.6
2.6
1.6
Grade Equivalent Score
Female, Fall
Male, Fall
Female, Summer
Male, Summer
1
2
3
4
5
6
Years Since Entering Grade 1

Figure 5

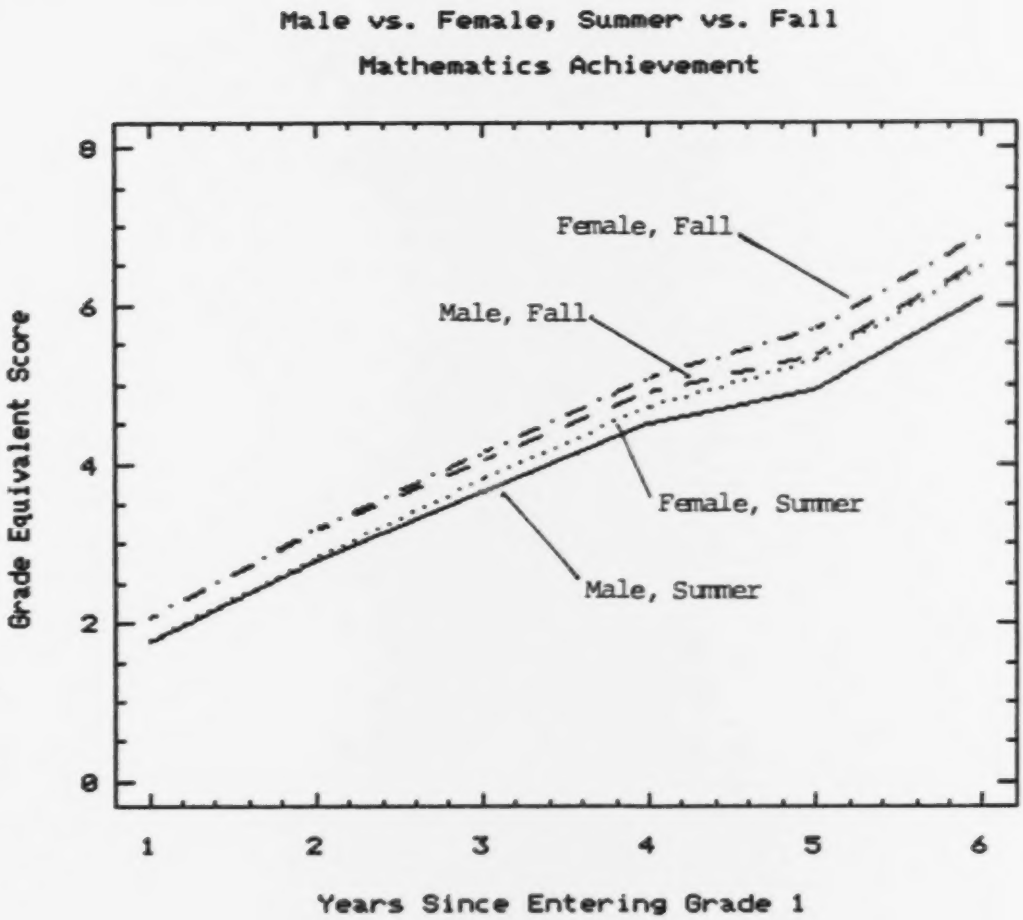
Male vs. Female, Summer vs. Fall
Mathematics Achievement
Grade Equivalent Score
0
2
4
6
8
1
2
3
4
5
6
Years Since Entering Grade 1
Female, Fall
Male, Fall
Female, Summer
Male, Summer

Figure 6

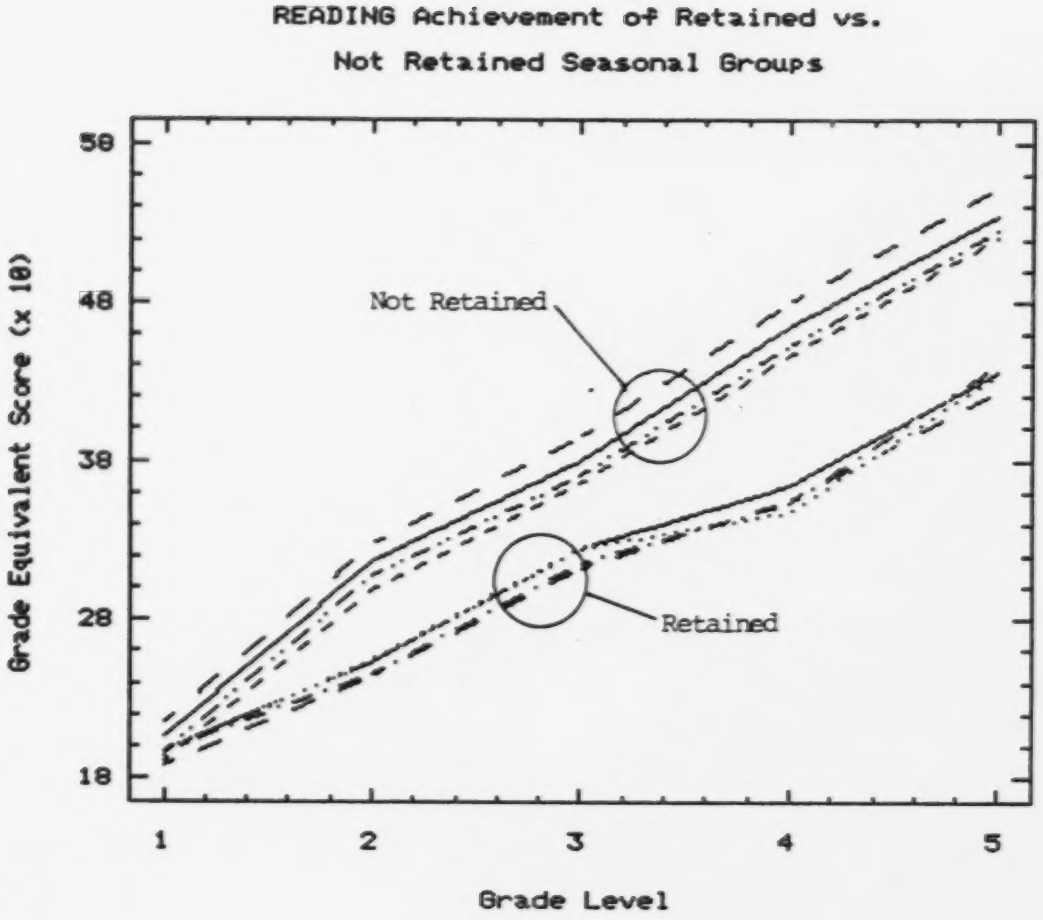
READING Achievement of Retained vs.
Not Retained Seasonal Groups
Grade Equivalent Score (x 10)
58
48
38
28
18
Not Retained
Retained
1
2
3
4
5
Grade Level

Figure 7

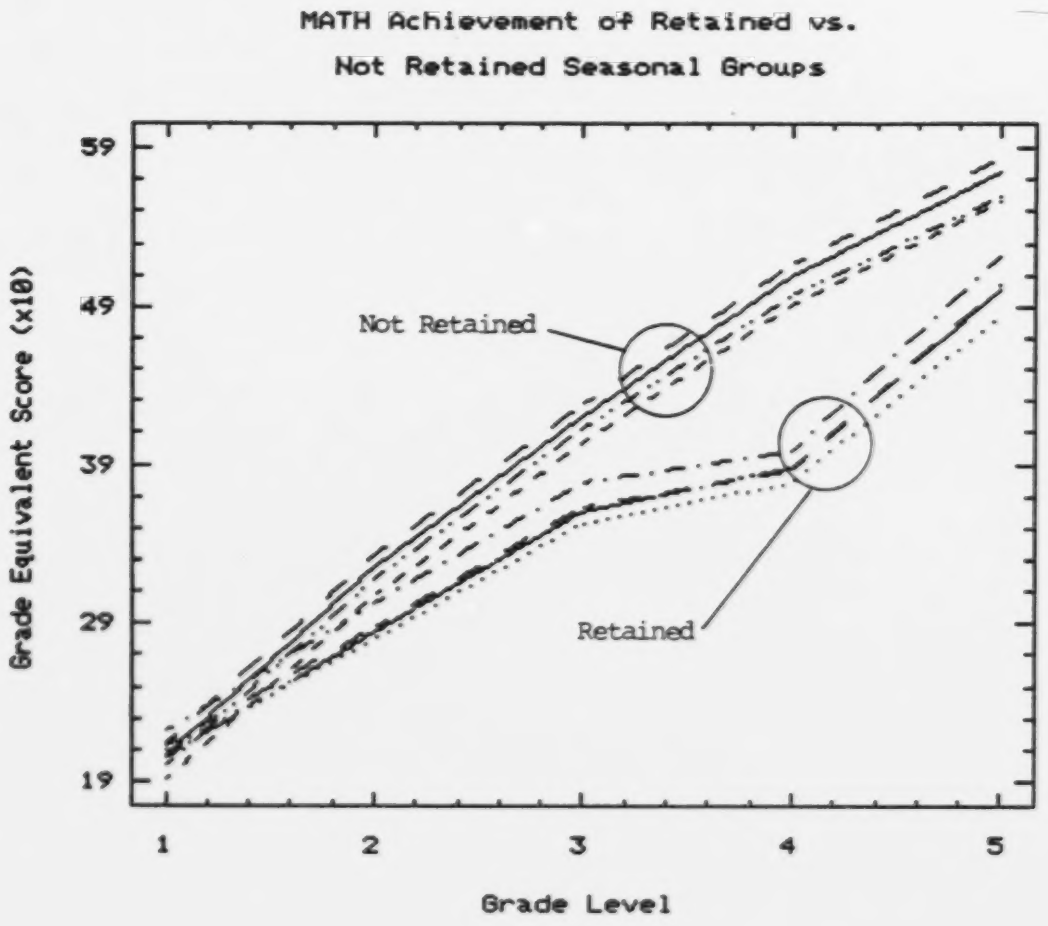
MATH Achievement of Retained vs.
Not Retained Seasonal Groups
Grade Equivalent Score (x10)
59
49
39
29
19
1
2
3
4
5
Grade Level
Not Retained
Retained

Figure 8

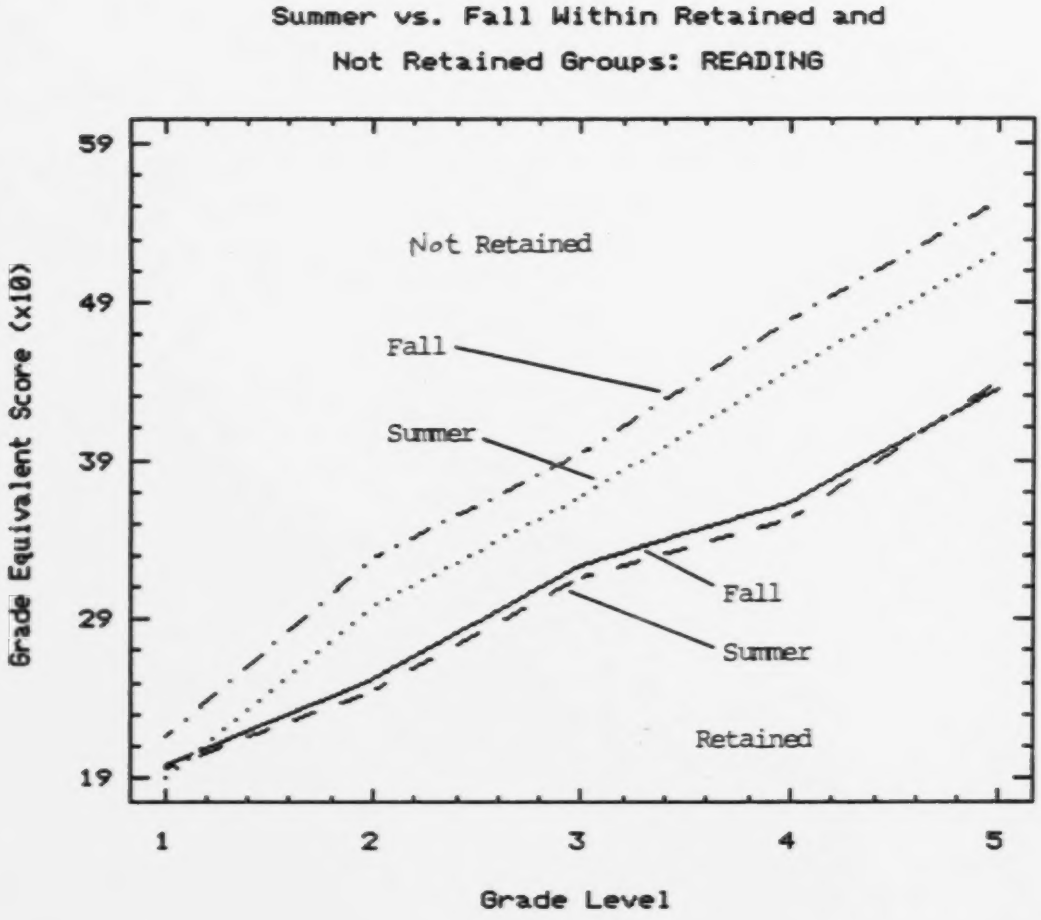
Summer vs. Fall Within Retained and
Not Retained Groups: READING
Grade Equivalent Score (x10)
59
49
39
29
19
Not Retained
Fall
Summer
Fall
Summer
Retained
1
2
3
4
5
Grade Level

Figure 9

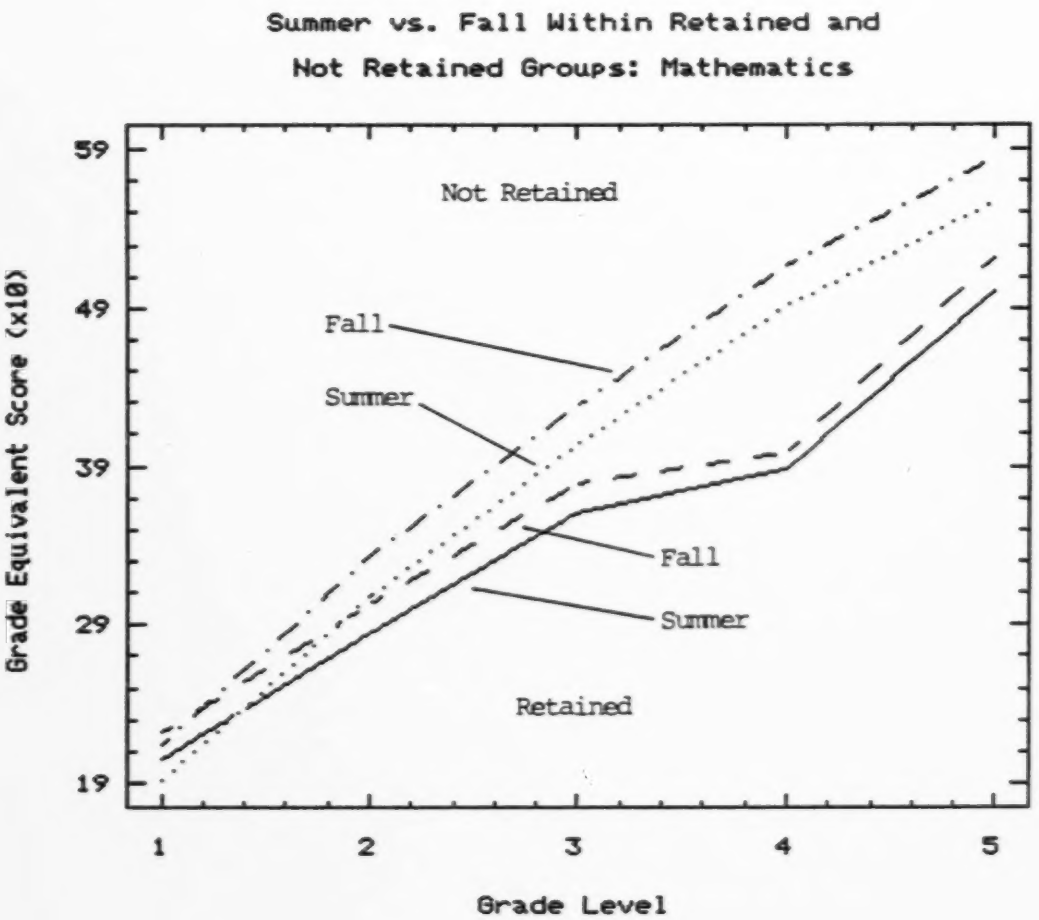
Summer vs. Fall Within Retained and
Not Retained Groups: Mathematics
Grade Equivalent Score (x10)
59
49
39
29
19
Not Retained
Fall
Summer
Fall
Summer
Retained
1
2
3
4
5
Grade Level

Figure 10